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PROJECT APOLLO
SPACECRAFT DEVELOPMENT
STATEMENT OF WORK

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

Langley Air Force Base, Va.

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4. PROGRAM MANAGEMENT.-

4.1 NASA ORGANIZATION.-

4.1.1 Overall Direction.- The Director, Office of Manned Space Flight Programs, is responsible for overall direction of Project Apollo.

4.1.1.1 Spacecraft System.- The NASA Manned Spacecraft Center has been assigned system management responsibilities for the Apollo Spacecraft including Test Launch Vehicle development and operations control and computing centers.

4.1.1.2 Tracking System.- The NASA Goddard Space Flight Center has been assigned system management responsibilities for the ground tracking and network system for Project Apollo except for the operations control and computing centers.

4.1.1.3 Launch Vehicle System.- The NASA Marshall Space Flight Center has been assigned system management responsibilities for the Apollo Launch Vehicle Systems excluding Test Launch Vehicles.

4.1.2 MSC Apollo Project Office.- The Apollo Project Office (APO) is established as a part of the NASA Manned Spacecraft Center reporting directly to the Center Director. The Project Office is responsible for planning and directing all activities associated with the accomplishment of the Apollo project. In this capacity, the Project Office is responsible for and has authority for technical direction of the Contractor within the scope of the contract. The Apollo Project Office is the official contact point for Contractors participating in the program, and the field contact point for other industry and government agencies on all official matters relating to the project (except that contractual matters are the responsibility of the Contracting Officers). Primary functions which will be performed by the Apollo Project Office include:

- a. Monitoring the work of the Apollo Principal Contractor and Associate Contractors.
- b. Reviewing and approving technical modifications, changes or revisions in the work undertaken by the Principal Contractor and Associate Contractors.

- c. Resolving technical problems which may arise between the Principal Contractor and Associate Contractors which are not directly resolved between the parties concerned.
- d. Maintaining close liaison with all Apollo contractors in order to keep fully and currently informed on the status of contract work, potential schedule delays, or technical problems which may delay project progress.

Responsibilities and procedures in these areas are discussed in greater detail in subsequent sections of this document. In carrying out these functions the Project Office will locate personnel at the site of contract work.

No technical direction which results in a change to this Statement of Work will become effective until receipt by the Contractor of a Contract Change Order or Contract Modification issued by the Contracting Officer pursuant to the clause of the contract entitled "Changes".

4.1.3

Monitoring.- The Apollo Project Office will monitor all technical activities of the Principal Contractor to provide technical direction, implementation, and coordination, to resolve and expedite problem areas, to assist in achieving reliability goals and quality assurance and to provide technical surveillance of design, testing, and manufacturing operations.

Authorized representatives of the MSC shall have the right to visit Subcontractors' plant at all times during the performance of this contract for making any inspections or obtaining any required information. Such visits will be coordinated with the Principal Contractor.

4.1.4

Coordination.- The MSC Apollo Project Office will arrange and coordinate all contacts and meetings and will provide for technical coordination between the Spacecraft Contractors, and the Manned Spacecraft Center, other NASA organizations and other government agencies as required to assist all levels in obtaining information, data, and assistance necessary for accomplishment of the project.

4.1.5

Data Submittal.- The Contractor shall submit all technical information, documentation, and data to the MSC Apollo Project Office unless otherwise specified in this Statement of Work. Other simultaneous parallel paths of distribution may be specified as the need arises. All additional distributions shall be subject to prior MSC APO approval.

4.2 CONTRACTOR ORGANIZATION.-

4.2.1 Project Organization.- The Apollo Principal Contractor shall establish, if not now in being, a strong Apollo organization, headed by a Program Manager and removed from other contractor programs to the extent necessary to prevent interference with a timely completion of the Apollo program.

4.2.2 Program Manager.- The Program Manager shall be a Vice President or shall function on the Vice Presidential level. He shall have the responsibility and necessary authority for the accomplishment of the Contractor's portion of the Apollo project.

4.2.3 Organization.- Consistent with good practice and to the extent necessary to preclude interference from existing or future projects, the Contractor shall adequately organize all elements, functions, and services required to accomplish the Apollo program into an appropriate organization responsible to the Program Manager.

4.2.4 Staff Offices.- The Contractor shall maintain, within his Apollo organization, staff offices to ensure the utilization of efficient engineering methods and management practices. These offices shall include the necessary functions to adequately control the program. The functions shall consist of but not be limited to:

Program control

System integration

Associate contractor coordination

Subcontractor control

Cost control

Reliability control

Documentation

NASA-MSC liaison

- 4.2.4.1 Engineering Changes.- A formal procedure shall be established for reviewing contract change proposals to ensure that all technical, planning, and cost aspects of the proposed changes are considered.
- 4.2.4.2 Subcontract Administration.- A staff group of subcontract specialists covering all essential disciplines shall assume responsibility for coordination of subcontract work. The Contractor shall establish and maintain resident field offices at the plants of major Subcontractors. The field offices shall have planning, procurement, engineering, quality control, and other representatives where required. To ensure expeditious communications, representatives of the major Subcontractors shall be assigned to the Principal Contractor's plant.
- 4.2.4.3 Reliability Organization.- The reliability plan shall identify the organization responsible to management for the overall reliability function and shall clearly define its responsibility for both policy and action. It shall stipulate the authority delegated to this organization to enforce its policies and assure necessary action. Line organization responsibilities and the relationship between line, service, staff, and policy organizations for reliability shall be identified. The reliability organization shall report to top management and receive top management support.
- 4.2.5 Delineation of Organization.- A delineation of the Principal Contractor's management organization and procedures shall be included as a part of the program plan specified in Section 4.3.2.1 and shall include the following:
- a. The responsibilities of the various portions of Principal Contractor's organization.
 - b. The division of responsibilities between the Principal Contractor and Subcontractors.
 - c. The specific program control techniques to be used.
 - d. The provisions for an orderly flow of communications within the Principal Contractor's organization and with Subcontractors.

4.2.6

Principal Associate Contractor Relations.- The NASA Manned Spacecraft Center will determine the division of responsibilities between the Principal Contractor and Associate Contractors. The Principal Contractor and each Associate Contractor shall determine, mutually agree upon, and document operating procedures and interface definitions, specifications and control methods. Each document shall require MSC approval.

4.2.6.1

Navigation and Guidance Contractor.- For the case of the Navigation and Guidance System, the MIT Instrumentation Laboratory shall be considered the Associate Contractor for Navigation and Guidance.

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4.3

PROGRAM CONTROL.-

4.3.1

General.- The MSC will exercise program control through use of program planning documents, periodic reviews, PERT, cost reports and such other management tools as may be required, including frequent scheduled and non-scheduled meetings.

4.3.1.1

Apollo Master Schedule.- All plans, schedules, PERT networks and phasing charts and deliveries shall be consonant with the Apollo Master Schedule (Fig. 4-1). The preliminary Flight Test and Mission Schedule (Fig. 4-2) shall be considered firm to January 1, 1963 but shall be used only as a guide for planning purposes for subsequent years.

4.3.1.2

Periodic Reviews.- Periodic technical and management program progress reviews of all aspects of the contractors work will be conducted by the MSC. These reviews will be conducted at the Manned Spacecraft Center, and the Principal, Associate and Subcontractor's plants as required. These reviews are intended to encompass major developmental milestones and/or problem areas.

4.3.1.3

Mockup Inspections.- The MSC will conduct mockup inspections at the Principal Contractor's plant. These inspections will cover the adequacy of the design of the command and service modules, their systems, and their compatibility with other elements of the space craft. Mockup inspections will progress from preliminary to final.

4.3.1.4

Symposia.- The NASA-MSC will conduct government-industry symposia with Principal, Associate and Subcontractor participation as appropriate.

4.3.2

Program Planning.- The detailed program plans, schedules, and requirements prepared by the Principal Contractor in accordance with Section 2. shall encompass the activities of all contractors and government agencies supporting the Apollo program and shall indicate their relationship to each other. A common, systematic breakdown of the various elements of the project shall be used in the preparation of these plans, schedules and requirements. These plans, schedules and requirements shall be documented as described in the following paragraphs. Phasing and milestone charts may be submitted in the form of time-

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based PERT networks where appropriate. All plans and revisions shall be subject to approval of the MSC.

4.3.2.1

Program Plan.- This document shall be the basic document which describes the overall plan for the conduct of Project Apollo. The plan shall delineate the method by which the Contractor intends to comply with the Statement of Work. The plan shall summarize management and control functions, design and development approaches, test program requirements and plans, production, quality control, logistic support requirements and such other planning documents as are specified in the Statement of Work. It shall include master phasing charts and milestone charts for the overall program; general management, technical, manufacturing, facilities, test, and support schedules; manpower requirements for performance of the project; and detailed phasing charts. Each detailed phasing chart shall portray important activities, their beginning and completion points and points at which decisions must be made. The approved program plan shall be used by the Contractor to guide his efforts. Major actions and events required of all agencies affecting the development of the Apollo spacecraft shall be shown including government as well as major contractors and subcontractors. Anticipated schedule problems shall be identified and the intended method for their solution indicated. This plan shall be prepared in close coordination with the MSC.

4.3.2.2

Facilities Plan.- This report shall cover the complete requirements for facilities development of the Apollo spacecraft and shall identify those which are to be government furnished. Industrial, development, range, operations, and all other facility requirements shall be described in detail, including any necessary modifications of existing facilities. Schedules showing required availability and modification dates, and plans for accomplishing necessary design and construction shall be included. This plan shall be prepared in close coordination with the MSC.

4.3.2.3

Test Plan.- The Contractor shall provide a test plan for the entire program. The plan shall cover all types of tests required including such items as significant engineering development tests, design verification tests, tests to determine operating environments or conditions, qualification tests, prelaunch tests, and flight tests.

It shall outline the types and quantities of tests to be run, equipment and configurations to be tested, concepts and objectives of the tests, test locations, support requirements, and major time phasing, and shall identify those which are to be performed by the government. The preliminary Flight Test and Mission Schedule attached as Figure 4-2 shall be utilized in the preparation of the Test Plan. This plan shall be prepared in close coordination with the MSC.

- 4.3.2.4 Manufacturing Plan.- The Contractor shall provide a manufacturing plan including such items as plans, schedules, methods, and controls.
- 4.3.2.5 Reliability Plan.- The Contractor shall prepare a reliability plan in accordance with Mil-R-27542 (USAF).
- 4.3.2.6 Maintenance Plan.- The Contractor shall prepare a maintenance plan which describes the detail requirements necessary to provide for the maintenance of all equipment throughout all phases of the program, in accordance with contractually-established maintenance concepts. The plan shall include maintenance during factory testing, storage, assembly, and prelaunch testing. This plan shall be prepared in close coordination with the MSC.
- 4.3.2.7 Support Plan.- The Contractor shall prepare a support plan which describes his support of the operations of the Apollo Spacecraft. The Contractor's support shall be consonant with the participation of the NASA as delineated in Section 2. The support plan shall include a description of all required functions of equipment overhaul, material (spares) support, transportation, and preparation of support manuals. Material support considerations shall include the methods of selection, distribution and control of spare parts, and the disposition of obsolete spare parts. Transportation considerations shall include the total transportation including Spacecraft transportation, peculiar spare parts and GSE requiring transportation, and other pertinent transportation data. Packaging requirements shall be specified in the plan. Support manual considerations shall include requirements, scope of coverage, format, change program, and other pertinent information. This plan shall be prepared in close coordination with the MSC.

- 4.3.2.8 Training Plan. - The Contractor shall prepare a Training Plan covering training of flight, ground operations, and maintenance personnel as well as training facilities, equipment, aids, materials, manuals, and maintenance support. The training plan shall be supported by an analysis of the task required of each type of personnel to be trained.
- 4.3.2.9 End-Item Test Plan. - The Contractor shall provide an End-Item Test Plan in accordance with the provisions of paragraph 7.4.2.1 of reference 1 of Part 2.
- 4.3.3 PERT. - The MSC will utilize the NASA-PERT system as a management tool in planning and controlling the Apollo Project. The NASA-PERT system will be implemented and maintained in accordance with the NASA-PERT handbook and the NASA General Management Instruction 4-1-5, dated September 1, 1961.
- 4.3.3.1 PERT Implementation. - The NASA-PERT system shall be established and implemented by a PERT team consisting of Contractor and MSC representatives. Activities necessary to implement NASA-PERT shall commence within 30 days after letter contract date. Implementation of NASA-PERT shall be completed on or before June 30, 1962. The number and scope of networks will be established by the MSC upon recommendations of the PERT team. The Contractor's tasks shall include participation as required in the activities of the PERT team, initial identification of events and activities comprising each network, and initial estimates of activity times. Each estimation of activity time shall be accompanied by an estimation of direct labor, in man-hours, associated with the activity time.
- 4.3.3.2 PERT Reporting. - Reporting against and updating of individual networks will commence as soon as individual networks are developed and approved. As individual networks are approved the Contractor shall submit biweekly variance reports, as described in the NASA-PERT handbook to the Manned Spacecraft Center or as otherwise specified by the Contracting Officer.

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The computer input data shall be transmitted on alternate Fridays (the reporting date) via TWX or phone, as required, in order to be received by the Manned Spacecraft Center by the following Saturday morning. The input data to be transmitted by the Contractor shall be current as of the reporting date.

4.3.3.3

The Contractor shall prepare an initial PERT Event and Activities Description document which will provide detail descriptions of the events and activities which comprise the PERT networks required by the MSC. This description is to include definition of essential elements of the tasks, the approach, methods, procedures, and estimated direct labor, in man-hours, to be employed.

4.3.4

Financial Management.- The financial management report to be prepared and submitted by the Principal Contractor shall be in accordance with the format shown in Appendix 4-A. In addition to costs, the direct manhours associated with each line item shall be entered parenthetically under the appropriate dollar line item.

4.3.4.1

Line Items.- The cost report submitted on MSC Form 124 (Appendix 4-A-1) shall include the following line items, their subtotals; and the contract total (shown on first line of the first sheet).

- a. Direct labor hours, direct labor costs, and overhead listed separately for engineering, tooling, production, inspection, tests and support operations.
- b. Recorded total material, parts, subcontracts, and procurement burden. All subcontracts totaling more than \$500,000 shall be listed individually.
- c. Other direct costs, i.e., travel and subsistence, auto computation, etc.
- d. Total general and administrative expense.
- e. Fee

4.3.4.2

Subdivisions of Work.- Until June 30, 1962, the line items for subdivisions of work shall be reported for each major spacecraft system and subsystem.

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- 4.3.4.3 PERT-Associated Costs.- Commencing with the June 30, 1962, Monthly Financial Management Report, the line items for subdivision of work shall reflect cost categories compatible with NASA-PERT networks. These cost categories will be selected in a manner which will permit integrated time/cost management control and reporting. Implementation of the NASA-PERT system is a necessary prerequisite to implementation of a PERT-associated cost reporting system. MSC and Contractor activities necessary for implementation of PERT-associated costs will proceed in parallel with PERT implementation activities. Continuous effort shall be employed during PERT implementation activities to insure that PERT activities and events are compatible with cost categories. The cost categories to be reported by the Contractor will be determined by the MSC on the basis of recommendations by the PERT implementation team and after discussion with the Principal Contractor.
- 4.3.4.4 Reorientation.- Although the line items to be reported will normally remain stable over long periods of time, the dynamic nature of the project will result in periodic reorientations of the work which will necessitate changes to the cost categories to be reported. If such change is required, the Contracting Officer will promptly notify the Contractor.
- 4.3.4.5 Graphical Summaries.- The graphical summaries of cost and man-hour data shall include cost and man-hours for engineering, tooling, production, inspection, procurement, general and administrative expense, and total contract cost. Actual data shall be used to the end of the reporting period and estimates used beyond the reporting period to contract completion.
- 4.3.5 Changes.- Any plans, schedules, or requirements proposed in accordance with sections 4.3.2, 4.3.3, and 4.3.4 and any revisions or changes thereto which effect the approved schedule of contract performance or appreciably increase or decrease the cost of the contract will require prior contractual coverage.

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4.4 DELIVERIES.-

4.4.1 Schedule.- All hardware, data, operational support and such other material and services determined to be necessary shall be released to test activities or otherwise delivered in accordance with the Manned Spacecraft Center approved program, the Apollo Master Schedule (Figure 4-1) and the preliminary Flight Test and Mission Schedule (Figure 4-2). The latter shall be used for planning purposes only for the period subsequent to January 1, 1963.

4.4.2 Hardware List.- Commensurate with program requirements and lead times involved, the Contractor shall prepare and furnish a complete list of all deliverable hardware required for the Apollo program including a list of spares, a list of all hardware to be GFE, and a list of all GFP support items. A brief justification for each hardware item requirement and the delivery date (s) thereof shall be included.

4.4.3 Hardware Deliveries.- The deliverable hardware shall include the test articles, consisting of dummy, boilerplate, and prototype Spacecraft, specified in Figure 4-3 together with such other test articles and systems, support equipment, spares and materials as may be required for the Apollo program.

4.4.4 Mockups.- The mockups to be provided by the Contractor with the appropriate assistance of the Associate contractors shall include but not be limited to the following:

Complete Spacecraft

Cabin interior arrangement

Cabin exterior equipment

Air-lock and docking

Environmental Control Sys.

Reaction Control System

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Crew Support System

Model to determine antenna
radiation pattern

Handling and transportation

Module and adapter interface

4.5 DOCUMENTATION.-

4.5.1 GENERAL.- The Contractor shall provide the documentation described in the following paragraphs in accordance with the delivery schedules, type classifications, and quantities listed in Appendix 4-C. All documentation required shall be classified as one of three types. Type I documentation shall be submitted to the MSC for approval. Type II documentation shall not require approval but shall be submitted for coordination, surveillance, and/or information. Type III documentation shall be retained by the Contractor and made available to authorized representatives of the NASA for review, upon request. THE PREPARATION OF TYPE I DOCUMENTATION BY THE CONTRACTOR SHALL BE CONDUCTED IN CLOSE COORDINATION WITH THE NASA. IMPLEMENTATION OF TYPE I DOCUMENTATION SHALL NOT PROCEED UNTIL AFTER APPROVAL BY NASA OR UNTIL 10 DAYS AFTER SUBMITTED, WHICHEVER IS EARLIER.

4.5.1.1 Submission.- The Spacecraft Contractor shall submit all data and documentation to the MSC Apollo Project Office, unless otherwise specified in this statement of work. Other simultaneous parallel paths of distribution shall be as specified by the MSC Apollo Project Office. All distributions shall be subject to prior MSC Apollo Project Office approval.

4.5.1.2 Document Revision.- The Contractor shall prepare and submit a method of document revision which will provide the MSC Apollo Project Office and other designated document recipients with the most current documentation as practicable.

4.5.2 Specifications.-

4.5.2.1 General.- The Contractor shall prepare the specifications indicated in the following paragraphs. Where specific missions dictate deviations to the requirements of individual specifications, an addendum shall be prepared, for the documents affected, which defines the changes for that mission. This is intended to present any configuration variations on a comparative basis to assure that full consideration is given to the basic objectives at all times, and to prevent compromise of these objectives.

4.5.2.2 Spacecraft Performance Specification.- This specification

shall specify the performance requirements of the spacecraft. The specification shall define the general composition of the spacecraft, identify its major systems and modules, establish their functional relationships, and provide for their integration into the spacecraft.

- 4.5.2.3 Spacecraft-Module and Spacecraft-Adapter Performance and Interface Specifications.- These specifications, one for each module and the spacecraft adapter, shall define the external design load envelope, performance, and general configuration parameters of the various Spacecraft modules and the Spacecraft adapter, and shall specify in detail the interface requirements of each module and the Spacecraft adapter.
- 4.5.2.4 Ground-Support-Equipment Specification.- This specification shall specify the general performance requirements for the Spacecraft GSE. The specification shall define the major areas in which GSE is required and shall identify the major equipment required for:
- a. Launch, test, and checkout
 - b. Service, transport, and handling
 - c. Maintenance
 - d. Recovery
- 4.5.2.5 Ground-Support-Equipment Performance and Interface Specifications.- These specifications shall define the function, performance, and configuration of the GSE required for the Spacecraft and adapter and shall specify in detail the interface requirements of this GSE.
- 4.5.2.6 Apollo Design Criteria Specification.- The document shall define the complete design criteria for the Spacecraft and spacecraft systems and for all ground equipment. The design criteria shall incorporate the guidelines of Part 3 of the Statement of Work, where applicable. Design criteria shall include safety factors, life sciences criteria including man's physiological and performance limitations, metabolic requirements, human factor design standards, environmental criteria, systems performance margins, and reliability and flight safety requirements.

- 4.5.2.7 Mockup Specifications.- The Contractor shall prepare a mockup specification for each mockup specified in this Statement of Work or as may be required. These specifications shall be submitted to NASA for approval prior to the start of mockup fabrication.
- 4.5.2.8 Ground Operational Support System Performance and Interface Specification.- This specification shall be prepared by the Contractor in close coordination with NASA Manned Spacecraft Center and the other government agencies responsible for the ground operational support system, and shall specify the functional performance, and special requirements of the ground operational support system. This specification shall identify the stations, equipments, and facilities required, and any modifications required to accomplish the necessary functions for the program. It shall establish requirements for the integration of all network elements and establish their functional relationship. It shall specify the interface requirements between this network and all other system elements and subsystems.
- 4.5.2.9 Ground Operational Support System Equipment Performance and Interface Specification.- These specifications, one for each new equipment or each equipment requiring modifications, shall be prepared by the Contractor in close coordination with NASA Manned Spacecraft Center and the other government agencies responsible for the Ground Operational Support System; shall define the function, performance, and general configuration parameters; and shall specify in detail the interface requirements.
- 4.5.2.10 Spacecraft Subsystem Specifications.- The Contractor shall prepare subsystem and other equipment specifications which define the function, performance, and configuration, and include qualification, reliability and acceptance requirements for the equipment which he furnishes.
- 4.5.2.11 Material, Parts, and Process Specifications.- The Contractor shall provide all material, parts, and process specifications which are used during the project. In cases where adequate materials and parts specifications do not exist, or are not suitable for the intended use, procurement specifications will be prepared by the Contractor. Where standards and process specifications covering items such as cleaning, forming, heat treatment, etc., are not available or are not adequate, process specifications will be prepared by the Contractor.

Materials specifications shall include requirements relative to toxicity and fire hazards under environmental extremes.

- 4.5.2.12 Flight Crew Performance Specification.- This specification shall specify the performance requirements of the crewmen for each mission and under all operational conditions. The specification shall define tasks at any station during the various phases of the mission. It will establish the crew integration and team functional requirements, as well as recreational, exercise and off-duty procedures.
- 4.5.2.13 Spacecraft Systems Monitoring Personnel Performance Specification.- This specification shall specify the performance requirements of the Spacecraft systems monitoring personnel under all preflight and operational conditions. The specification shall define the skills, experience and training requirements to perform each task at any ground station. The specification will establish crew integration and team functional requirements.
- 4.5.2.14 Training Equipment Specifications.- Training equipment specifications shall be prepared by the Contractor in coordination with NASA. A separate specification shall be prepared for each new piece of equipment and each equipment modification.
- 4.5.2.15 Final Specifications.- The Contractor shall furnish one complete set of reproducible procurement specifications for each Contractor-furnished-system under this Contract. Specifications shall be suitable for use in the procurement of any future vehicles.
- 4.5.3 Program Plans and Reports.-
- 4.5.3.1 Planning Reports.- The Contractor shall prepare and submit the program planning reports specified in section 4.3.2. The Contractor shall be responsible for maintenance of these plans through a revision system he will develop. All revisions shall be made with MSC Apollo Projects Office approval. The program planning reports shall consist of the following documents:
- 4.5.3.1.1 Program Plan
- 4.5.3.1.2 Facilities Plan

- 4.5.3.1.3 Test Plan
- 4.5.3.1.4 Manufacturing Plan
- 4.5.3.1.5 Reliability Plan
- 4.5.3.1.6 Maintenance Plan
- 4.5.3.1.7 Support Plan
- 4.5.3.1.8 Training Plan
- 4.5.3.1.9 End-Item Test Plan
- 4.5.3.2 PERT Reports.- PERT reports shall be submitted in accordance with the NASA-PERT Handbook and NASA Management Instruction 4-1-5. The first biweekly PERT computer input report shall be submitted prior to June 30, 1962, as required by the MSC.
- 4.5.3.2.1 The Contractor shall submit a PERT Event and Activities Document as specified in section 4.3.3.
- 4.5.3.3 Monthly Financial Management Report.- This report shall consist of a monthly cost report in accordance with section 4.3.4 and the format shown in Appendix 4-A.
- 4.5.3.4 Contractor Interface Documents.- In accordance with section 4.2.6, the Contractor shall prepare and submit documents in which the operating procedures, and interface definitions, specifications, and control methods between the Contractor and the Associate Contractors are specified. These documents shall require NASA approval.
- 4.5.3.5 Hardware List.- The Contractor shall prepare and submit a list of all deliverable hardware items in accordance with Section 4.4.2.
- 4.5.3.6 Mockup Inspection Plan.- The Contractor shall prepare and submit a mockup inspection plan for MSC Apollo Project Office approval.
- 4.5.4 Progress and Status Reports.-
- 4.5.4.1 Monthly Progress Reports.- The Contractor shall submit monthly progress reports of all work accomplished during each month of Contract performance. For those months

where a quarterly progress report is required, the report of monthly progress shall be included in the quarterly report. The monthly progress report shall cover the status of the development of the Apollo Spacecraft including management and major technical aspects, facilities and other similar items. A quantitative description of overall progress, an indication of any current problems which may impede progress and the proposed corrective action, and a discussion of the work to be performed during the next monthly reporting period shall be included.

- 4.5.4.2 Quarterly Progress Reports.- This report shall cover progress and status of the development of the Apollo Spacecraft including management and major technical aspects, facilities, and other similar items but excluding costs, for the preceding quarter. Major problems encountered and the solutions undertaken, or planned, shall be included. Any situation requiring MSC action or assistance shall be highlighted. Progress and status in relation to the master phasing and milestone schedules and any actual or anticipated changes thereto shall be shown, either in chart or by data sufficient to show this information on the charts previously submitted. In addition to factual data, these reports shall include a separate analysis section which interprets the results obtained, recommends further action, and relates occurrences to the ultimate objectives of the Contract work. Sufficient diagrams, sketches, curves, photographs and drawings shall be included to convey the intended meaning.
- 4.5.4.3 Final Report.- The Contractor shall submit a final report which documents and summarizes the results of the entire contract work, including recommendations and conclusions based on the experience and results obtained. The final report shall include, tables, drafts, diagrams, curves, sketches, photographs and drawings in sufficient detail to comprehensively explain the results achieved under the contract.
- 4.5.4.4 Weekly Launch Site Activities Reports.- This report shall cover the status of the launch site activities relative to the preparation of the Spacecraft.
- 4.5.4.5 Monthly Weight and Balance Reports.- The Contractor shall prepare weight and balance reports which provide continuing weight and balance information for all Spacecraft equipment.

- 4.5.4.6 Emergency Action Reports.- These reports shall be used by the Contractor for reporting any urgent matters which, unless solved immediately, could cause serious program delay. Such reports shall be forwarded by the most expeditious means available. Such urgent matters shall include
- 4.5.4.6.1 Strikes
- 4.5.4.6.2 Shortages of material and equipment in critical areas
- 4.5.4.6.3 Transportation tie-ups
- 4.5.4.6.4 Safety of flight problems
- 4.5.4.6.5 Critical development problems
- 4.5.4.6.6 Factors outside the Contractor's responsibility.
- 4.5.4.7 Quarterly Reliability Status Report.- The Contractor shall prepare reliability status reports which provide a comprehensive view of the reliability program including the current demonstrated reliability level for each major element and component, as defined in the reliability program plan; a discussion of reliability problems; failure analyses; and results of corrective action taken and corrective actions proposed. The Contractor shall propose recommendations for redesign, tradeoffs, mission rules, etc., as a result of the analysis.
- 4.5.4.8 Still Photographs.- The Contractor shall provide still photographs in accordance with the detailed instructions and requirements of Appendix 4-B.
- 4.5.4.9 Motion Picture Photography.- The Contractor shall provide 16-mm motion picture coverage in accordance with the detailed instructions and requirements of Appendix 4-B.
- 4.5.4.10 Spacecraft Launch Vehicle Integration Reports.- The Contractor, in cooperation with NASA, shall prepare a report for each of the launch vehicles to be used with the Spacecraft, defining the performance, general characteristics, and interface characteristics of the launch vehicle assumed during design of the spacecraft.

- 4.5.4.11 Spacecraft Flight Reports.- A report showing the results of each flight test shall be submitted. Each such report shall consist of a detailed evaluation of the particular flight test and shall include the following types of information.
- 4.5.4.11.1 A section on the performance of each spacecraft subsystem together with an analysis of any malfunctions and the probable cause of the subject malfunction.
- 4.5.4.11.2 A section devoted to unexpected significant Spacecraft difficulties, or results which are encountered during the flight test of preparations therefore, their bearing on future tests, and any corrective measures on product improvement proposed.
- 4.5.4.12 Spacecraft Equipment Status Report.- This report shall present a list of all spacecraft equipment indicating pertinent characteristics, qualification status, required qualification status, usage, reuseability, importance to spacecraft mission, and flight performance of each part.
- 4.5.4.13 Quarterly Radiation Shielding Status Report.- The Contractor shall prepare radiation shielding status reports which present the calculated radiation shielding provided for the crew by the current spacecraft design.
- 4.5.4.14 Trajectory Analysis Reports.- The Contractor shall prepare trajectory analysis reports which present the results of trajectory analysis studies for each type mission (e.g., superorbital reentry tests, circumlunar, lunar landing, etc.) covering all phases of each type mission (e.g. mid-course, reentry, etc.).
- 4.5.5 Non-Scheduled Reports and Data.-
- 4.5.5.1 Technical Data, Reports, and Analysis.- The Contractor shall prepare technical reports which describe the studies, analyses, and results of the contractual effort. The reports shall be prepared at times when complete blocks of work have been accomplished and, if appropriate, as logical subdivisions thereof. Major technical areas shall not be combined in a single document, but shall be published individually. The individual reports shall cover such technical specialties as trajectory analyses, stress analyses, life science studies, reliability analyses, spacecraft-module and spacecraft-adaptor external loads analyses, failure-mode analyses, etc.

- 4.5.5.2 Design Information.- The Contractor shall establish a method of submitting and shall submit periodically, preliminary design information before finalization of design to assist in expediting the interchange of design data and to keep MSC technical design groups continually and currently appraised of the Spacecraft Contractor's activities, philosophy, approaches, solutions and design evaluations of all phases and facets of spacecraft and associate system design. This procedure will allow MSC technical personnel the prerogative to comment before all design features are finalized and will tend to expedite the final approval of Type I documentation.
- 4.5.5.3 Materials Reports.- This report shall be submitted in accordance with the clause contained in the contract schedule entitled, "Materials Reports".
- 4.5.6 Qualification Reports and Data.-
- 4.5.6.1 Qualification Status List.- The Contractor shall prepare and maintain a status list showing the planned and completed qualification of each part, component, and subsystem for which he is responsible. The basis for qualification of those parts and components for which Apollo qualification tests are not required shall be shown. Where qualification is based on qualification tests conducted under the Apollo program, the date of such tests and reference to the detailed test reports shall be shown.
- 4.5.6.2 Qualification Test Reports and Data.- Data showing the results of all qualification tests shall be maintained and indexed in a master file by the Contractor. Reports shall be forwarded to the NASA Manned Spacecraft Center showing the results of all qualification tests.
- 4.5.6.3 Failure Data.- The Contractor shall prepare failure reports on all failures which occur on Contractor-furnished and Government-furnished equipment during all phases of testing, operation, etc. A monthly summary of failure and trouble data shall be supplied to NASA.
- 4.5.6.4 Monthly Failure Summary.- The Contractor shall prepare a monthly failure summary which summarizes the failure reports prepared above.
- 4.5.7 Quality Control Reports.-
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- 4.5.7.1 Acceptance Test Data Sheets.- Copies of data sheets showing the results of acceptance tests performed by the Contractor on major end items of ground support equipment and on major components of the navigation and guidance system shall be prepared and furnished for review by the NASA Manned Spacecraft Center. Acceptance test data on all other items shall be maintained by the Contractor and shall be made available for review by representatives of the NASA Manned Spacecraft Center upon request.
- 4.5.7.2 Data and Reports on Other Tests.- Data showing the results of all required tests not otherwise provided for herein, which are the responsibility of the Contractor, shall be recorded and maintained on file. Reports shall be submitted on each of these tests or test series.
- 4.5.7.3 Special Sampling Plans.- The Contractor shall provide special sampling plans (defined as those other than military standard sampling plans) in accordance with the provisions of para. 12.3 of reference 1 of Part 2.
- 4.5.7.4 Quality Control Plan.- The Contractor shall provide a Quality Control Plan in accordance with the provisions of para. 3.1 of reference 1 of Part 2.
- 4.5.7.5 Inspection, Measuring, and Test Equipment Procedures.- The Contractor shall provide inspection, measuring, and test equipment procedures in accordance with the provisions of para. 9.6 of reference 1 of Part 2.
- 4.5.7.6 Monthly Quality Report.- The Contractor shall provide a monthly quality report in accordance with the provisions of para. 14.2 and para. 14.3 of reference 1 of Part 2.
- 4.5.7.7 Quarterly Summaries of Quality Control Performance Audits.- The Contractor shall provide quarterly summaries of quality performance audits in accordance with the provisions of para. 15.2 of reference 1 of Part 2.
- 4.5.7.8 Inspection and Test Procedures.- The Contractor shall provide inspection and test procedures in accordance with the provisions of para. 7.3.1 of reference 1 of Part 2.

- 4.5.7.9 Process Control Procedures.- The Contractor shall provide process control procedures in accordance with the provisions of para. 7.5.4.1 of reference 1 of Part 2.
- 4.5.7.10 Storage Procedures for End Items.- The Contractor shall provide storage procedures for end items in accordance with the provision of para. 11.5 of reference 1 of Part 2.
- 4.5.7.11 Application of Sampling Plans.- The Contractor shall provide details of the application of sampling plans in accordance with the provisions of para. 12.3 of reference 1 of Part 2.
- 4.5.8 Drawings.- Drawings, layouts of various major assemblies, inboard profiles, etc., required by the NASA for coordination, technical monitoring, and/or information shall be furnished to authorized representatives of the NASA upon request both prior to and subsequent to release.
- 4.5.8.1 Maintenance.- The Contractor shall maintain a complete up-to-date set of Contractor and subcontractor drawings sufficient to describe each of the equipments for which he is responsible. These drawings shall be prepared using the Contractor's internal drawing system and shall conform to high quality commercial standards.
- 4.5.8.2 Final Drawing Submission.- A complete set of final drawings shall be provided as specified in the contract on microfilm in a form compatible with the system in use by the NASA-MSC. Drawings shall completely describe each vehicle furnished by the Contractor, and shall include all final vehicle hardware. Drawings shall be suitable for use in future procurement of vehicles. Copies and/or reproducible drawings of all designs associated with GFE/vehicle coordination shall be provided as required. Copies of all final drawings of both the Contractor and his subcontractors shall be furnished to MSC. MSC also shall be furnished with copies of subcontractor-supplied design data and operation and service requirements. Copies of all Contractor and subcontractor procurement specifications shall be furnished as set forth in the contract.
- 4.5.8.3 Drawing Approval.- Approval of Contractor's drawings will be general and will not relieve the Contractor from the responsibility for the correctness of the drawings furnished by him, nor for their compliance

4.5.8.3
(cont.)

with the specifications, nor for proper fitting and construction of the work, nor for furnishing materials and work required by the contract which may not be indicated on the drawings when approved. The approval of the Contractor's drawings shall not be construed as approving changes in scope of the contract unless such changes have been specifically approved as contract changes.

4.5.8.4

Drawing List.- The Contractor shall prepare a drawing list which presents all assigned drawing numbers and titles. Periodic revisions shall reflect additions, deletions, and release dates.

4.5.9

Support Manuals.-

4.5.9.1

General.- The Contractor shall prepare and provide manuals to define, in detail, operating and launch instructions as well as maintenance, check-out, and test procedures as indicated in the following paragraphs. The instructions and procedures contained in the manuals shall be arranged to permit operation, maintenance, check-out or test of the equipment covered by the appropriate manual in the minimum feasible amount of time. The material shall be designed to be readily understood by the personnel who will operate and/or maintain the equipment.

4.5.9.2

Check-out Manuals.- The check-out manuals shall provide the procedure and information required to perform check-out and tests of the appropriate systems. They shall permit complete check-out in the maintenance area or launch site.

4.5.9.3

Spacecraft Operations Manuals.- Spacecraft launch operation manuals shall define the detailed procedures required to perform the tasks directly associated with the Spacecraft prior to, including, and subsequent to launch. The manuals shall present, in sequential order, the instructions for tasks performed by members of the launch, flight support and recovery teams who participate in Spacecraft operations.

4.5.9.4

Flight Operation Manual.- This operation manual shall provide the instructions and procedures to be followed by the Spacecraft crew during all phases of the mission. The tasks to be performed by the Spacecraft Crew shall

- 4.5.9.4 (cont.) be presented in a logical sequence in individual sections pertinent to each phase of the mission.
- 4.5.9.5 Maintenance and Repair Manuals.- These manuals shall provide complete instructions and procedures for the maintenance and repair of the Command Module, service module, spacecraft adapter, and associated ground support equipment excluding the navigation and guidance systems and scientific instrumentation. A manual shall be provided for each major item of equipment or sub-system.
- 4.5.9.6 Spacecraft Familiarization Manual.- The spacecraft familiarization manual shall provide a description of the complete spacecraft. Each operational system shall be described in general terms but with sufficient detail to convey a clear understanding of the system as a whole. This manual shall cover the general spacecraft operational procedures and include a reference index of all operating and maintenance manuals. This manual shall serve as an orientation-indoctrination type document and as a reference document containing information relative to all systems and major components.
- 4.5.9.7 Ground Support Equipment Manuals.- A manual shall be provided for each major item of Command Module, service module, and spacecraft adapter ground support equipment excluding the navigation and guidance system and scientific instrumentation ground support equipment. The manuals shall contain all the procedural instructions directly associated with, and required for, operation and check-out of the ground support equipment indicated above.
- 4.5.9.8 Spacecraft Description Manual.- A Spacecraft Description Manual shall be prepared for each spacecraft intended for flight, and shall provide a description of the complete spacecraft. Each operational system shall be described in sufficient detail to indicate its operating characteristics and limitations. Deviations of detail design or operation from that which is established as standard for "production" items should be specifically identified. The manuals will serve as a series of documents that establish the exact configuration of each spacecraft. Timely revision and updating of each manual shall be provided for.

- 4.5.9.9 Transportation and Handling Manual.- Those manual(s) shall provide the procedures and special requirements for transportation, handling, and storage of the spacecraft and major items of GSE.
- 4.5.9.10 Training Manuals.- The Contractor shall provide training manuals for the NASA-conducted flight crew and ground crew training programs associated with the training equipment supplied by the Contractor. Each trainer or part trainer supplied by the Contractor shall be provided with a maintenance manual giving complete instruction for repair and maintenance of the equipment and an instructor's manual which shall include operating instructions and a recommended syllabus for the use of the trainer. A flight operational training manual(s) shall be provided suitable for use in the combined flight crew and flight monitor training. This manual shall describe operational characteristics of the spacecraft equipment in terms of the displays available to the flight crew and ground crew. It shall describe the major types of malfunctions and how they may be isolated by ground and flight crew. A recommended syllabus for flight monitor-flight crew combined exercises shall be provided.

Figure 4-2 PROJECT APOLLO - PRELIMINARY FLIGHT TEST & MISSION SCHEDULE.

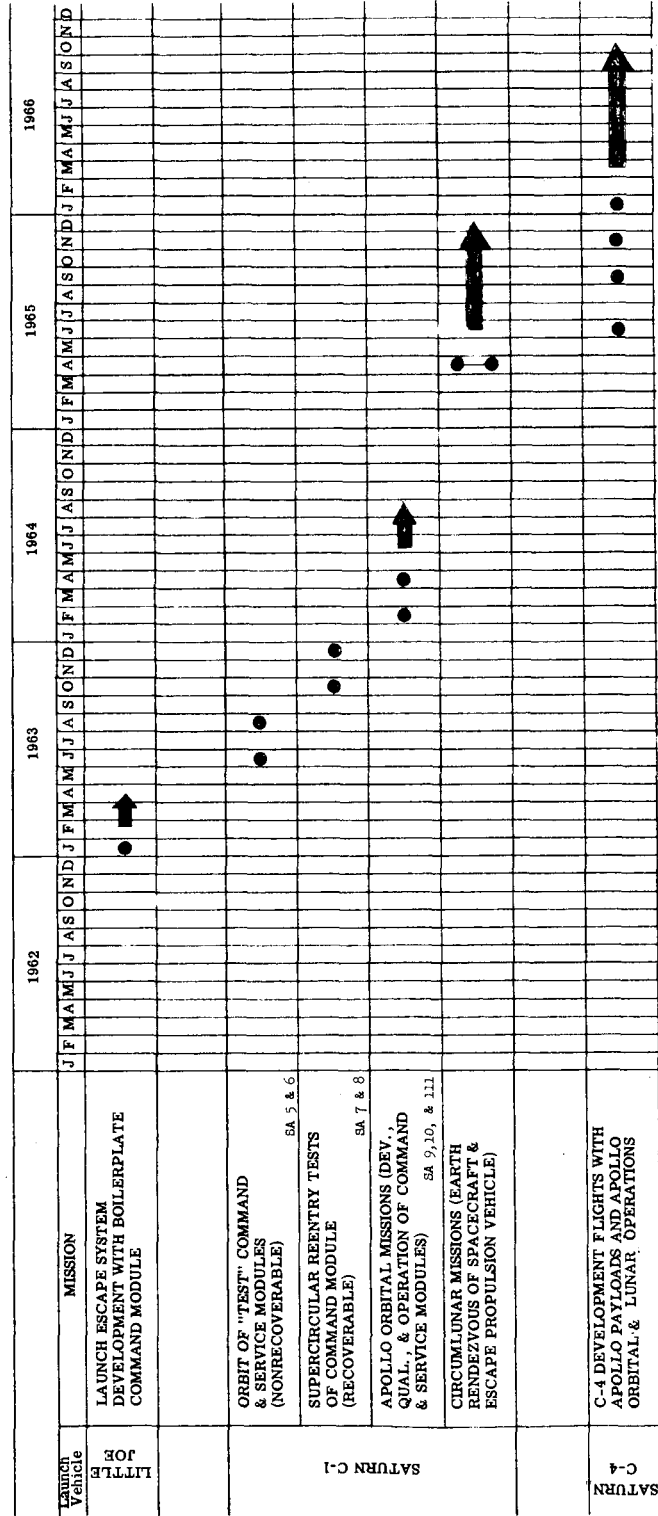


Figure 4-3 TEST SPACECRAFT DELIVERY REQUIREMENTS

TEST ARTICLE	DELIVERY DATE	LAUNCH LOCATION	LAUNCH DATE	LAUNCH VEHICLE
Full Scale Dynamic Model of SA-5	10/1/62	MSFC	-	-
Boiler Plate C/M	12/1/62	Wallops Island	1/15/63	Little Joe I
Boiler Plate C/M	2/1/63	Wallops Island	3/15/63	Little Joe I
Boiler Plate C/M and S/M	3/15/63	AMR	6/30/63	Saturn (SA-5)
Boiler Plate C/M + S/M	5/15/63	AMR	8/15/63	Saturn (SA-6)
Boiler Plate C/M + S/M Systems as Required	6/15/63	AMR	10/15/63	Saturn (SA-7)
Boiler Plate C/M + S/M Systems as Required	8/15/63	AMR	12/15/63	Saturn (SA-8)

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APPENDIX 4-A

GENERAL FORMAT FOR MONTHLY FINANCIAL MANAGEMENT REPORT

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(12) Contractor's Remarks

(13) Signature and Date

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INSTRUCTIONS FOR COMPLETING MSC FORM NO. 124

Submission.- Reports submitted for the months ending March 31, June 30, September 30, and December 31, for both (1) subdivisions of work and (2) elements of cost will have all columns completed. These reports are due the 15th day of the succeeding month. The remaining monthly reports submitted, unless otherwise required by the Contracting Officer, will be limited to subdivisions of work and will include only items 1 through 8, 9a(1) and (2), and 9d(1); columns 11a, b, and c will be completed if there is a change in dates. The latter reports are due the 10th day of the succeeding month.

1. Contract Description, Number and Type.- Enter the type, i.e., cost-plus-fixed-fee, and complete letter or contract symbol and number; include any letter identification as shown in the contractual document being reported. Enter the number of the latest amendment, if applicable. Include a brief statement covering contract items or services being procured.

2. To.- Enter the name of the NASA field installation and the name of the contracting officer to whom the report is submitted.

3. From.- Enter full name and address of contractor and, if applicable, the contractor's division performing the contract.

4. a. Contract Value.- Enter the amount which has been established for performance of the total contract, i.e., the total estimated cost plus fixed fee of all work to be performed under the contract, including amendments. Include only those contract change notices that have been formalized.

b. Contract Ceiling.- Enter the funding (obligations) to date of the contract (as amended).

c. Invoice Amounts Billed.- Enter the total amount of invoices billed by the contractor against the contract.

d. Total Payments Received.- Enter the total amounts of payments received by the contractor for this contract.

5. Date.- Enter the ending date of the period and submittal date.

6. Sheet --- of ---.- Enter the number of the sheet and indicate total number of sheets submitted for this report.

7. Item No.- Identify each line item by number and letter, as appropriate.

8. Subdivisions of Work and/or Elements of Cost.- The report will be submitted showing (1) subdivisions of work and (2) elements of cost. Show the fixed fee as one line item. When reporting subdivisions of work enter a short description of each subdivision of work and task under such subdivision. When reporting elements of cost, show the subdivision of work and enter thereunder a short description of each element of cost.

9. Total Contractor Effort.-

a. Costs.- Costs of goods and services used to accomplish the assigned work regardless of when received or paid. Materials not yet charged to work in process (Inventories) will be foot-noted as separate line items. (These costs will be used for reporting purposes only and will not be binding on either the contractor or the Government.)

(1) During Reporting Period.- Enter the costs for the reporting period.

(2) To Date.- Enter the total costs of the contract to date, through the end of the reporting period.

b. Estimated Costs to Program Completion.- Enter the appropriate quarter and fiscal year designations in the column headings. Enter the estimated costs to be incurred during each projected period. These entries will not be cumulative. They will be forecasts for each of the next five quarters; balance of the fiscal year (1, 2 or 0 quarters); next fiscal year and balance thereafter to program completion. The total of the estimated costs of completion is the total of Columns 9b(1) through 9b(8).

c. Grand Total.- Enter the total costs to be incurred during the program. The amount is a total of Columns 9a(2) and 9b(9).

d. Unfilled Orders Outstanding.- For the purpose of this report, unfilled orders are defined as an incurrence of a firm obligation by the contractor, such as subcontracts, purchase orders, authorized travel and similar expenses which have not become costs. Enter the appropriate quarter and fiscal year designations coinciding with 9b. Enter the total of unfilled orders outstanding as of the end of the periods indicated.

10. Contract Costs at Completion.-

a. Last Report.- Enter the amount as indicated in Column 10b of the last report submitted.

b. This Report.- Enter the updated estimate of the total cost to NASA for completion of the contractual task. This estimate should reflect, at the time of the report, any foreseeable increases or decreases in the contract value or ceiling entered in Item 4. The estimated report will be used for planning purposes only and will not be binding on either the contractor or the Government. This is the same as Column 9c.

c. Amount Change (Plus or Minus).- Enter the difference between Columns 10a and 10b. Give a brief but complete explanation of the need for any increase or the means of achieving a decrease in the space provided for in Item 12 on the reverse of the form. This entry shall be made even though separate requests for such a change have been previously submitted by the contractor.

11. Program Completion Date.- Complete quarterly for subdivisions of work or monthly if there is a change in dates.

a. Last Report.- Enter completion date as shown in Column 11b of the last report submitted.

b. This Report.- Enter the estimated date of completion of the subdivisions of work. This entry shall not serve as a notice to the Government of late delivery nor as acquiescence in such late delivery by the Government.

c. Change.- Enter the difference between Columns 11a and 11b by weeks. Enter a brief comment of why a change in time phasing has taken place and how the time change affects the previously submitted time phasing schedule of the total contractual assignment. If additional time is required, include an explanation of what means would be necessary to restore the schedule for the completion of the contract. If acceleration has been indicated, include a statement explaining the factors which led to a decrease in time phasing.

12. Contractor's Remarks.- Enter explanations relating to changes in amounts in Column 10c and changes in time in Column 11c and any other comments considered appropriate.

13. Signature and Date.- The authorized contractor representative will sign and date the report.

CONTRACT NAS
PROJECT APOLLO SPACECRAFT
FINANCIAL STATUS SUMMARY

I
SUMMARY OF ESTIMATED COST TO NASA

Basic Contract
 CCP's Included in Amendments
 CCO's Approved by NASA
 CCP's Pending NASA Action
 CCP's Not Yet Submitted
 Total CCP's
 ESTIMATED COST TO NASA

Total CPFF
Cumulative
Total

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II
 SUMMARY OF ACTUAL COSTS, BILLINGS,
 PAYMENTS AND FUNDS AVAILABLE FOR BILLING

	<u>Cost</u>	<u>Fixed Fee</u>	<u>Total CPFF</u>
--	-------------	------------------	-------------------

Cost Incurred by Contractor

Amount Billed to NASA

Payments Received by Contractor

Funds Available for Billing

III
SUMMARY OF TOTAL FUNDS OBLIGATED

Funding

Obligated Funds Available for Billing

Funds Obligated by Change Notice - Not Available
for Billing

TOTAL FUNDS OBLIGATED

IV
OBLIGATED FUNDS AVAILABLE FOR BILLING

	<u>Cost</u>	<u>Fixed Fee</u>	<u>Total CPFF</u>
Basic Contract			
Amendments			
TOTAL FUNDS AVAILABLE FOR BILLING	=	=	=

Basic Contract

Amendments

TOTAL FUNDS AVAILABLE FOR BILLING

V
FUNDS OBLIGATED BY CHANGE NOTICES
NOT YET INCORPORATED IN AMENDMENT

<u>Change Notice</u>	<u>CCP No.</u>	<u>Funding</u>	<u>Change Notice</u>	<u>CCP No.</u>	<u>Funding</u>

TOTAL FUNDS OBLIGATED BY CHANGE NOTICES

=

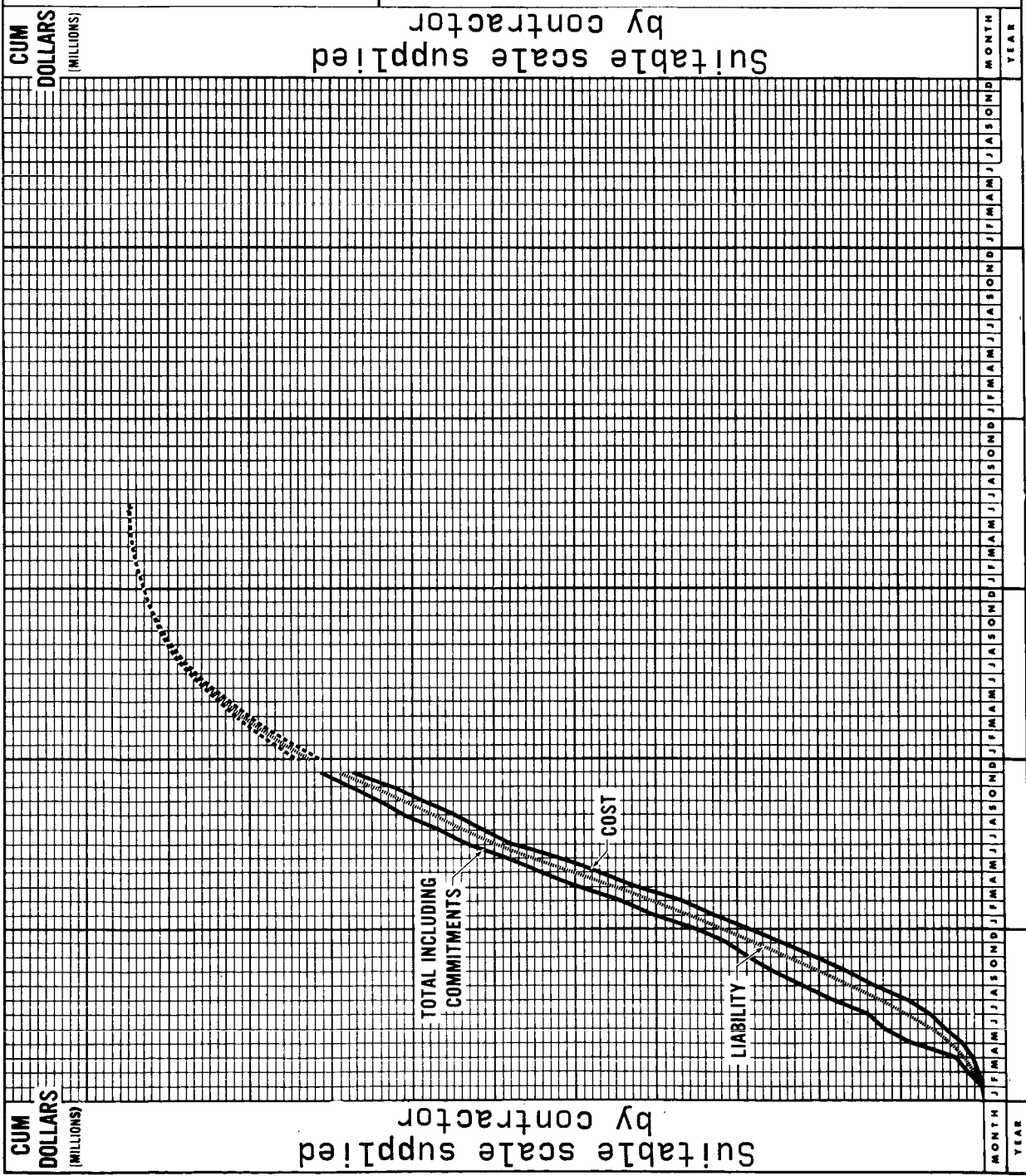
VI
DETAIL OF ESTIMATED COST TO NASA

<u>CCP NUMBER</u>	<u>DESCRIPTION</u>	<u>APPROVED BY</u>	<u>TOTAL CPFF</u>	<u>CUMULATIVE TOTAL</u>
	Basic Contract			
	CCP's INCLUDED IN AMENDMENTS			
	TOTAL CCP s INCLUDED IN AMENDMENTS			
	CCP s APPROVED BY NASA			
	TOTAL CCP s APPROVED BY NASA			
	CCP s PENDING NASA ACTION			
	TOTAL CCP s PENDING NASA ACTION			
	CCP s NOT YET SUBMITTED			
	TOTAL CCP s NOT YET SUBMITTED			

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PROJECT APOLLO
ANTICIPATED
COST TO NASA
PRINCIPAL
CONTRACTOR

INCLUDES THE FOLLOWING:
VALUE OF CONTRACTUALLY
AUTHORIZED WORK
EST. ADD'L AUTHORIZATIONS
EST. TOTAL PROGRAM COST
ESTIMATED ADD'L WORK INCLUDES THE FOLLOWING:
ADDITIONAL SPARES & GSE
CAPSULE NO. 5 MISSION & SCHEDULE CHANGE
ADDITIONAL TEST SITE SUPPORT
MISCELLANEOUS



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APPENDIX 4-B

INSTRUCTIONS AND REQUIREMENTS

FOR

PHOTOGRAPHIC DOCUMENTATION

FOR

PROJECT APOLLO

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APPENDIX 4-B
Instructions and Requirements for Photographic
Documentation of Project Apollo

1. PHOTOGRAPHY. The contractor shall accomplish still and/or motion picture photography on both a continuing and an "as negotiated" basis as indicated herein. Photographic coverage shall include documentation of highlight aspects of research and development, facilities construction and utilization, hardware fabrication and production, test activities, including rapid sequence and high speed engineering sequential motion picture coverage of appropriate test phases, and related events and subjects involving the contractor's area of responsibility.
2. OBJECTIVE. The objective of the photographic coverage specified herein is to satisfy a continuing NASA - MSC need for documentation and reporting of the contractors research and development activities and progress. The still and/or motion picture coverage thus obtained will be used for purposes of program evaluation and management analysis, written report backup, and the preparation of training, orientation, and briefing films. Other uses include legal, historical, and the fulfillment of various information services requirements.
3. STANDARDIZATION. For purposes of compatibility and in the interest of economy in reproduction, it is necessary to standardize in the type of original films used by the various producers and contractors. For normal motion picture photography (16 mm, 24 f.p.s.) Eastman Ektachrome Commercial type 7255, or equivalent, is recommended. When light conditions prevent the use of this film, Ektachrome ER type 7257 (daylight), or Ektachrome ER type 7258 (tungsten), or equivalent, may be used. These high speed emulsions (ASA 160-120) should be used only when absolutely necessary, as some quality losses result in duplication.
4. GENERAL MOTION PICTURE AND STILL PHOTOGRAPHIC SPECIFICATIONS. These instructions outline specifications for motion picture photography and the still picture documentation required. Changes to these specifications may be made only with the approval of the contracting officer.
 - a. Motion picture specifications:
 - (1) As a general rule, original motion picture photography shall be in 16 mm Ektachrome commercial, or equivalent, exposed at 24 frames per second. The use of 35 mm

color film must be specifically authorized by the contracting officer. Black-and-white film and other frame-rates may be used in instances where the capability of the color film or the normal frame-rates would be detrimental to the accomplishment of specialized photographic coverage, such as aerial, engineering sequential, and time measurement photography.

- (2) The contractor shall not project or cut original film exposed in connection with the contract, except to eliminate waste film caused by camera failure or faulty photographic techniques (gross over or underexposure, over or under development, out of focus, etc.) which results in qualitatively unsatisfactory film. Unusable heads and tails of scenes and unselected takes may be retained by the Contractor on file or destroyed at the Contractor's discretion.
- (3) All original camera film footage shall be slated whenever possible. Slate information shall include, as appropriate: contractor identification, project number and/or name, contract number, security classification, date photographed, scene and take number. Two copies of caption information describing the action involved in each scene and the significance of the sequence of which the individual scene is a part, shall be forwarded with all original camera film footage submitted to the NASA Manned Spacecraft Center, Apollo Project Office. All individual reels of film footage will bear head and tail security classification leaders.

b. Still Picture Specifications:

All still photography will be of professional quality and in a quantity that will meet the needs of both the NASA and the contractor for scientific, technical and reporting data required in support of the assigned research and development effort.

- (1) As a general rule, the still photography shall be accomplished on 4 X 5 inch black-and-white film, 4 X 5 inch negative or reversible color film may be used in those instances where it is deemed essential to record and present the subject matter distinctly and accurately

and for significant highlight events such as first flight, roll-outs, launch, mock-ups, etc. The original camera raw stock film shall be of a type determined by the contractor to be best suited to the recording objective under the prevailing environmental conditions of each photographic assignment.

- (2) The following data shall be lettered in ink on the clear margin of each original negative or color transparency on the acetate side starting from the left: negative number, date, contractor, and classification.
- (a) The negative number: This shall start with numeral 1 (one) for the first photograph of the calendar year on each specific contract of which the photographic coverage is a part.
 - (b) The date shall consist of numerals for the day of the month, followed by the abbreviated name of the month, followed by the last numerals of the calendar year.
 - (c) Contractor's and subcontractors' name if applicable, abbreviated, shall follow the date of photography.
 - (d) If the photograph is classified, the classification shall follow the contractor's name. A typical negative marking would be as follows: 120/14 JUL 62/ (Contractor's name)/Confidential.
 - (e) Each negative or color equivalent shall be placed in a separate negative preserver. A contact print of the negative shall be attached to the front of the envelope (to insure minimum handling of the negative). The negative identification data shall be marked on the preserver, starting in the top left front corner. In addition the preserver shall be conspicuously marked with the proper classification in accordance with DOD Industrial Security Manual, Section II, Handling of Classified Information.
 - (f) A written caption shall be prepared for each negative produced and forwarded under terms of this contract. This information must include the who, what, when, where, and why type of data as well as other pertinent facts, including the specific date the photograph was taken. If nicknames are used, explain their

meaning. The caption may be typed on a sheet of paper and placed inside the negative preserver, or attached to the back of the envelope. The captions shall be double-spaced.

- (g) The negative identification data specified above shall be reproduced on all prints made. This reproduction may be accomplished by any means available which will insure a permanent record of the identification data on each print, such as: photographic reproduction through the negative; by typing, waterproof ink lettering, ditto, or rubber stamp. In addition to the identification data, the front of each classified print shall be stamped with the appropriate classification (in the white border) at the top and bottom and on the back.

5. MOTION PICTURE REQUIREMENTS:

- a. Documentation.- The contractor will accomplish motion picture coverage of significant highlight events within the area of his activity, as they occur, and which are essential to the fulfillment of the NASA-MSC's need for engineering, evaluation, and management data, or for reporting purposes. This coverage will include the unsuccessful and unfavorable events as well as the positive aspects of the contractor's activity and progress.
- b. Film Clips.- The contractor shall accomplish additional motion picture coverage as required for the preparation of film clips as directed by the MSC Apollo Project Office. Subject matter of this film footage will include coverage of special happenings such as mock-ups, test activities, and other events which depict the program progress and status. Footage suitable for use in the various NASA-MSC film reports must portray a complete story of a specific research and development event, phase, or activity. The photographic coverage should include a variety of scenes of the reported item or event, i.e., establishing shots, medium shots, close-ups, and cutaways, to assist the NASA film editor in telling the story. The film footage should consist of full length, unedited, untitled, silent scenes of sufficient length to provide 5-10 minutes running time as received from the contractor.
- c. Special Film Requirements.- The production of briefing, concept, indoctrination films, and special animation sequences may be assigned to the contractor from time to time by the contracting

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officer. The production of these special film reports will be subject to contract negotiation.

6. STILL PHOTOGRAPHIC REQUIREMENTS. The contractor shall accomplish still photographic documentation of all significant highlight events within the area of his activity and responsibility as they occur and as he determines is essential to the fulfillment of MSC's and the contractor's need for engineering, evaluation, management data, and reporting purpose. "Special Interest" highlight events (roll-outs, first flights, etc.) shall be accomplished in color as specified in paragraph 4(b). Routine documentation will be done in black and white.
7. TRANSMITTAL OF PHOTOGRAPHIC MATERIALS:
 - a. Motion Picture Film
 - (1) All of the original motion picture footage produced and costed under terms of this contract is the property of the NASA. Unless otherwise specified, the contractor will forward all original motion picture material produced under this contract to NASA Manned Spacecraft Center, Apollo Project Office. Written information describing the activities and items shown in the film will accompany each shipment of film.
 - (2) When the contractor produces films other than those specified and/or requested by the contracting officer, utilizing film footage exposed and costed under this contract, it shall be at no expense to NASA. When such films are used for public release purposes by the contractor, they shall be reviewed by and receive final approval in writing from NASA Manned Spacecraft Center before being released for exhibition. Requests for release of such contractor sponsored films, including a viewing print of each, will be forwarded to the Apollo Project Office, NASA Manned Spacecraft Center.
 - (3) All classified motion picture film footage and completed film reports produced under this contract shall be handled in accordance with the provisions of DOD Industrial Security Manual, Section II, Handling of Classified Information. The original film and two prints which are made from the original and which match frame for frame will be submitted. In addition, two copies of written information describing the activities and items shown in the film footage, will be forwarded by the contractor to the NASA Manned Spacecraft Center, Apollo Project Office.

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b. Still Pictures

- (1) The black and white or color negative or color transparency, together with a contact print (of the black and white negative only) and two $8\frac{1}{2} \times 11$ " enlargements of the black and white negative shall be forwarded to the MSC Apollo Project Office.

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APPENDIX 4-C

DOCUMENTATION TYPE AND DELIVERY

SCHEDULE

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery * (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.1.2	Document Revision Methods	1	As required	I	5** 20***
4.5.2.2	Spacecraft Performance Specification	2	As required	I	20** 100***
4.5.2.3	Spacecraft-Module and Spacecraft-Adapter Performance and Interface Specifications	2	As required	I	20** 200***
4.5.2.4	Ground Support Equipment Specification	2	As required	I	20** 100***
4.5.2.5	Ground-Support-Equipment Performance and Interface Specifications	2	As required	I	20** 200***
4.5.2.6	Apollo Design Criteria Specification	2	As required	I	20** 50***
4.5.2.7	Mockup Specifications	2	As required	I	5** 20**
4.5.2.8	Ground Operational Support System Performance and Interface Specification	2	As required	I	50** 250***

* Initial delivery requirements are shown as time after date of contract, unless otherwise noted.

**Prior to NASA approval.

*** Subsequent to NASA approval.

DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.2.9	Ground Operational Support System Equipment Performance and Interface Specifications	4	As required	I	50** 250***
4.5.2.10	Spacecraft Subsystem Specifications	4	As required	I	20** 100***
4.5.2.11	Material, Parts, and Process Specifications to use	15 days prior to use	As required	I	20** 100***
4.5.2.12	Flight, Crew Performance Specifications	4	As required	I	20** 50***
4.5.2.13	Spacecraft System Monitoring Personnel Performance Specifications	4	As required	I	20** 50***
4.5.2.14	Training Equipment Specifications	4	As required	I	20** 50***
4.5.2.15	Final Specifications	6 months after completion of all other technical contractual requirements.		I	5** 1*** (reproducible)

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Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.3.1.1	Program Plan	2	As required	I	50** 100***
4.5.3.1.2	Facilities Plan	1	As required	I	20** 200***
				NASA approval required prior to implementation	
4.5.3.1.3	Test Plan	1	As required	I	50** 200***
4.5.3.1.4	Manufacturing Plan	2	As required	I	20** 50***
4.5.3.1.5	Part I: Reliability Program Plan	1	As required	I	20** 50***
	Part II: Reliability Test Plan	2	As required	I	20** 50***
4.5.3.1.6	Maintenance Plan	4	As required	I	20** 50***
4.5.3.1.7	Support Plan	2	As required	I	20** 50***

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Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.3.1.8	Training Plan	2	As required	I	20** 100***
4.5.3.1.9	End Item Test Plan	5	As required	I	20** 50***
4.5.3.2	PERT Reports	As required	Biweekly	II	1 (TWX)
4.5.3.2.1	PERT Events Document	2	As required	II	100
4.5.3.3	Monthly Financial Management Reports	10 days after end of first month	10 days after end of each interim month; 15 days after end of each quarter	II	25
4.5.3.4	Contractor Interface Document	2	As required	I	10** 20***
4.5.3.5	Hardware List	2	As required	I	20** 50***
4.5.3.6	Mockup Inspection Plan	2	As required	I	5** 20***

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.4.1	Monthly Progress Report	10 days after end of first month	10 days after end of month for first two months of each calendar quarter	II	100
4.5.4.2	Quarterly Progress Reports	10 days after end of first calendar quarter	10 days after end of each calendar quarter	II	100
4.5.4.3	Final Report	6 months after completion of all other technical contractual requirements	-	II	5 (1 reproducible.)
4.5.4.4	Weekly Launch Site Activities Reports	2 days after end of first week of operation at launch site	2 days after end of each week	II	100
4.5.4.5	Monthly Weight and Balance Reports	10 days after end of first month	10 days after end of each month	II	20
4.5.4.6	Emergency Action Reports	As required	-	II	20

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.4.7	Quarterly Reliability Status Report	1 month after end of first calendar quarter	1 month after end of each calendar quarter	II	20
4.5.4.8	Still Photographs	Contractor: 12 days after exposure, sub- mitted weekly Subcontractors: 20 days after exposure, submitted weekly	-	II	1 B/W Print Negative 2 ea. 8-1/2x11" enlargements
4.5.4.9	Motion Picture Photography				
	Documentation	Contractor: 20 days after shooting *		II	orig. plus 2 prints
		Subcontractor: 30 days after shooting *			
	Film Clips	15 days after completion of shooting		II	orig. plus 2 prints

* Certain film footage exposed for engineering sequential and metric data purposes may be held longer than the days specified with written notification including anticipated delivery date

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.4.10	Spacecraft Launch Vehicle Integration Report	1	As required	II	20
4.5.4.11	Spacecraft Flight Reports	1 month after each flight	-	I	20** 100***
4.5.4.12	Equipment Status	12	As required	II	10
4.5.4.13	Quarterly Radiation Shielding Status Report	30 days after end of second calendar quarter	30 days after end of each quarter	II	20
4.5.4.14	Trajectory Analysis Reports	75 days	As required	II	20
4.5.5.1	Technical Data, Reports and Analyses	2 weeks after completion of each block of effort or logical subdivisions thereof	-	II	20
4.5.5.2	Design Information	As required	-	II	3

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.5.3	Materials Reports	1 month after end of second calendar quarter	Subsequent Reports 1 month after every other calendar quarter. Final report 2 months after completion of the work for the final period of the contract	II	20
4.5.6.1	Qualification Status List	6	As required	II	20
4.5.6.2	Qualification Test Reports and Data	1 month after each test series	- - - - -	II(Reports) 20 III(Data)	
4.5.6.3	Failure Data	5 days after failure	As required	II	2
4.5.6.4	Monthly Failure Summaries	10 days after sixth month	10 days after end of each month	II	10
4.5.7.1	Acceptance Test Data Sheets	15 days after each test series		II (Major Components) III(all others)	20
4.5.7.2	Data and Reports on other Tests	1 month after each test or test series	- - - - -	II(Reports) 10 III(Data)	

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.7.3	Special Sampling Plans	1 month prior to use	As required	I	5**
4.5.7.4	Quality Control Plan				
	a. Preliminary	1 month	As required	I	20**
	b. Final	2 months	As required	I	20***
4.5.7.5	Inspection, measuring and test equipment procedures	1 month prior to use	As required	II	20**
4.5.7.6	Monthly Quality Report	10 days after end of twelfth month	10 days after end of each month	II	5
4.5.7.7	Quarterly Summary of Quality Control Performance Audit	15 days after end of fourth quarter	15 days after end of each calendar quarter	II	20
4.5.7.8	Inspection and Test Procedures	1 month prior to each test series	-	II	20
4.5.7.9	Process Control Procedures	2 weeks prior to intended use	As required	II	20

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Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.7.10	Storage Procedures for End Items	2 weeks prior to intended use	As required	II	20
4.5.7.11	Application of Sampling Plans	2 weeks prior to intended use	As required	II	20
4.5.8	Drawings	As requested	As requested	II	As requested
4.5.8.2	Final Drawings	6 months after completion of all other technical contractual requirements.		II	1
4.5.8.3	Drawing List	3	Biweekly	II	6
4.5.9.2	Checkout Manuals	9	As required	I	20** 100***
4.5.9.3	Spacecraft Operation Manuals	9	As required	I	20** 250***
4.5.9.4	Flight Operation Manual	6	As required	I	20** 100***
4.5.9.5	Maintenance and Repair Manuals	9	As required	I	20** 100***

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DOCUMENTATION TYPE AND DELIVERY SCHEDULE

Requirement Paragraph No.	Item	Initial Delivery (Months)	Subsequent Issues or Revisions	Documentation Type	No. of Copies
4.5.9.6	Spacecraft Familiarization Manual	4	As required	I	20** 500***
4.5.9.7	Ground Support Equipment Manuals	9	As required	I	20** 150***
4.5.9.8	Spacecraft Description Manuals	1 year prior to each launch	As required	II	100
4.5.9.9	Transportation and Handling Manual	9	As required	I	20** 100***
4.5.9.10	Training Manuals	9	As required	I	20** 100***

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